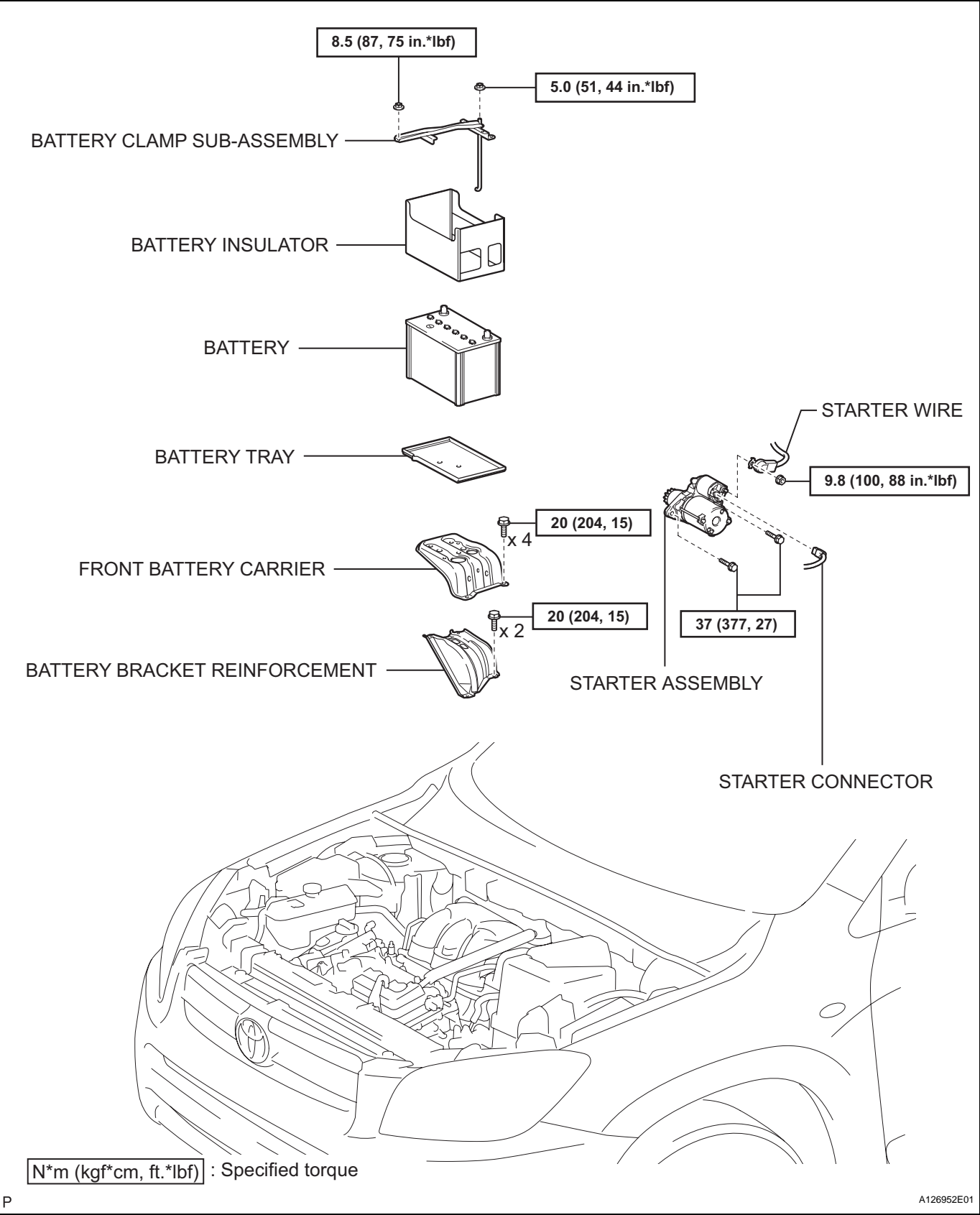
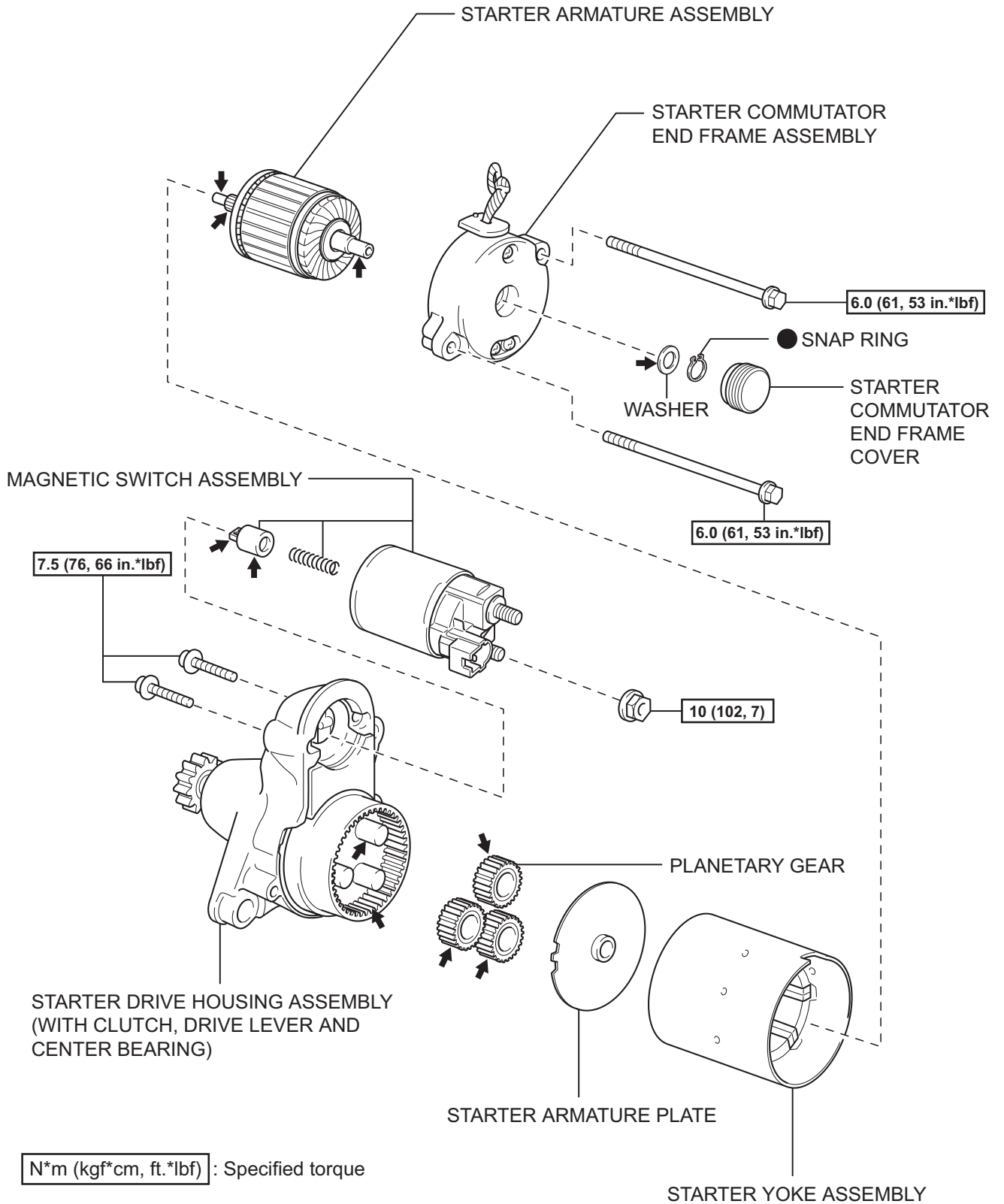


STARTER

COMPONENTS





ST

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **REMOVE BATTERY CLAMP SUB-ASSEMBLY**

(a) Loosen the bolt and nut, and remove the battery clamp.

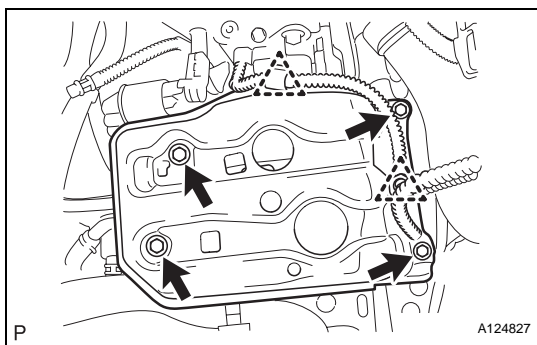
3. **REMOVE BATTERY INSULATOR**

4. **REMOVE BATTERY**

5. **REMOVE BATTERY TRAY**

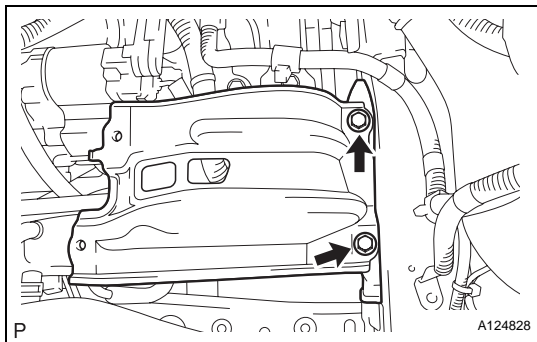
6. **REMOVE FRONT BATTERY CARRIER**

(a) Disconnect the 2 clamps of the engine wire.
(b) Remove the 4 bolts and front battery carrier.



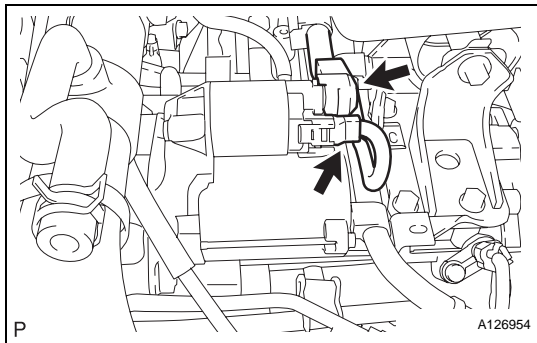
7. **REMOVE BATTERY BRACKET REINFORCEMENT**

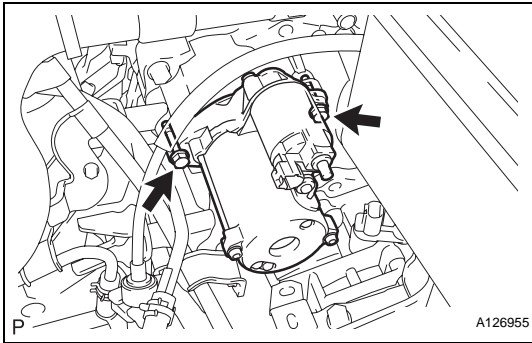
(a) Remove the 2 bolts and battery bracket reinforcement.



8. **REMOVE STARTER ASSEMBLY**

(a) Disconnect the starter connector.
(b) Open the terminal cap, remove the nut and disconnect the starter wire.

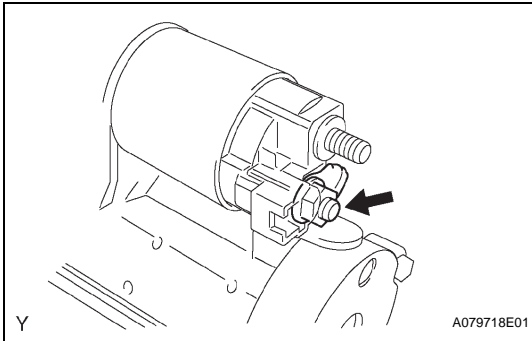




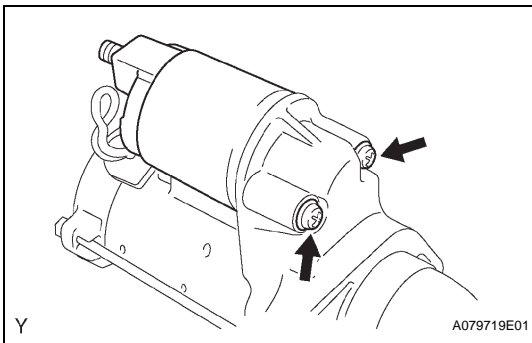
(c) Remove the 2 bolts and starter.

DISASSEMBLY

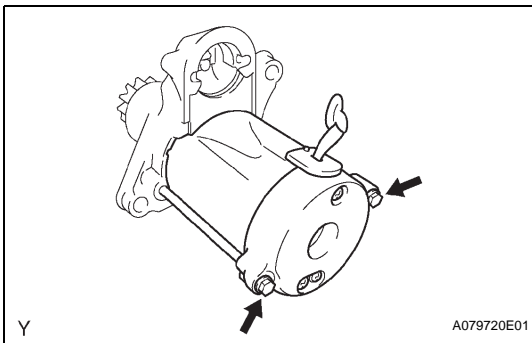
1. REMOVE MAGNETIC SWITCH ASSEMBLY



(a) Remove the nut and disconnect the lead wire from the magnetic switch assembly.

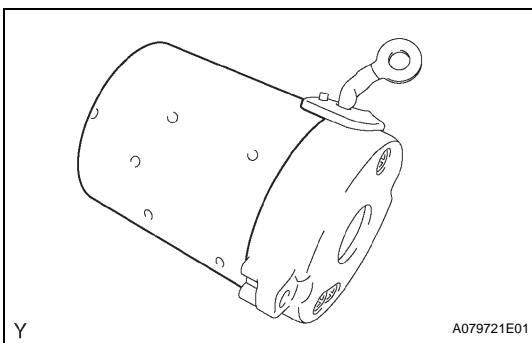


(b) Remove the 2 screws holding the magnetic switch assembly to the starter drive housing assembly.
 (c) Remove the magnetic switch assembly.
 (d) Remove the return spring and plunger from the starter drive housing assembly.



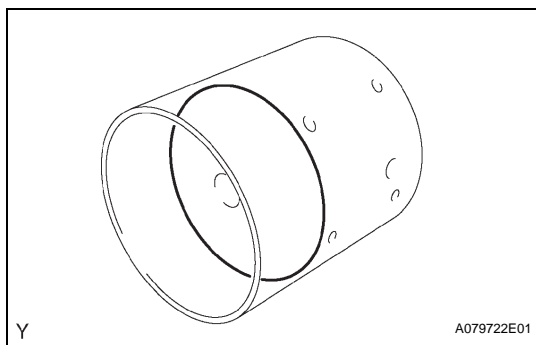
2. REMOVE STARTER YOKE ASSEMBLY

(a) Remove the 2 through-bolts, and pull out the starter yoke assembly together with the starter commutator end frame assembly.

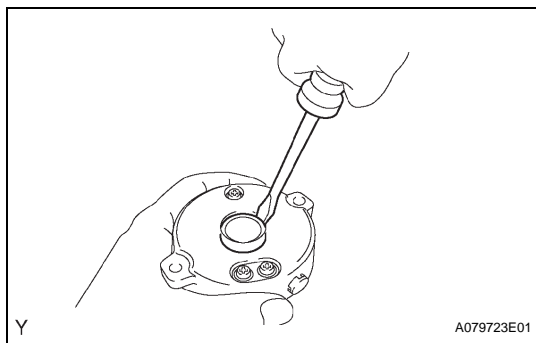


3. REMOVE STARTER COMMUTATOR END FRAME ASSEMBLY

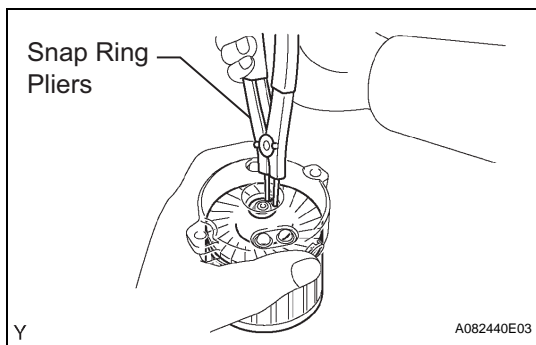
(a) Remove the starter commutator end frame assembly from the starter yoke assembly.

**4. REMOVE STARTER ARMATURE PLATE**

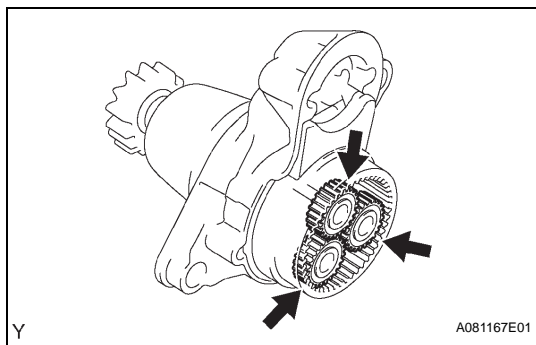
- (a) Remove the starter armature plate from the starter yoke assembly.

**5. REMOVE STARTER COMMUTATOR END FRAME COVER**

- (a) Using a screwdriver, pry out the starter commutator end frame cover.

**6. REMOVE STARTER ARMATURE ASSEMBLY**

- (a) Using snap ring pliers, remove the snap ring and plate washer.
(b) Remove the starter armature assembly from the starter commutator end frame assembly.

**7. REMOVE PLANETARY GEAR**

- (a) Remove the 3 planetary gears from the starter drive housing assembly.

INSPECTION

1. INSPECT STARTER ASSEMBLY

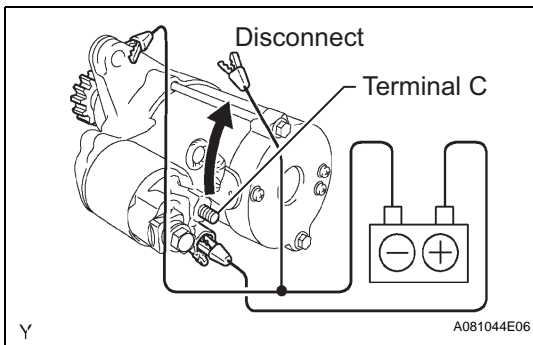
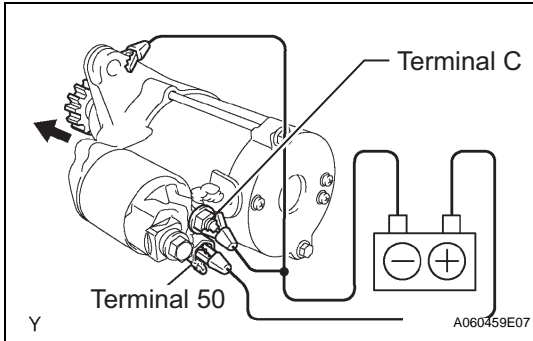
CAUTION:

These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

(a) Perform the pull-in test.

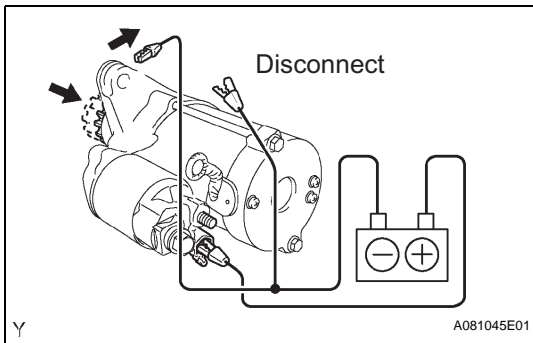
(1) Disconnect the lead wire from terminal C.

(2) Connect the battery to the magnetic switch assembly as shown in the illustration. Check that the clutch pinion gear extends. If the clutch pinion gear does not move, replace the magnetic switch assembly.



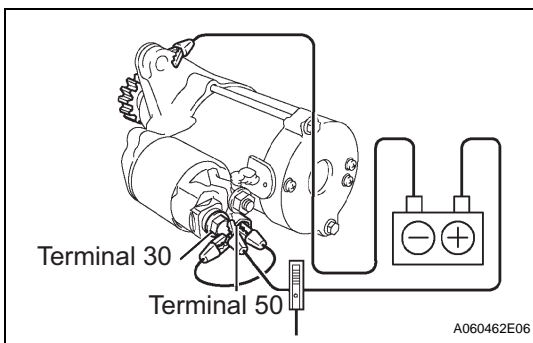
(b) Perform the hold-in test.

(1) Maintain the battery connections of the pull-in test above, but disconnect the negative (-) lead from terminal C. Check that the pinion gear remains extended. If the clutch pinion gear returns inward, replace the magnetic switch assembly.



(c) Check the clutch pinion gear return.

(1) Disconnect the negative (-) lead from the switch body. Check that the clutch pinion gear returns. If the clutch pinion gear does not return, replace the magnetic switch assembly.



(d) Perform the no-load performance test.

(1) Connect the lead wire to terminal C. Make sure that the lead is not grounded.

Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

(2) Clamp the starter in a vise.

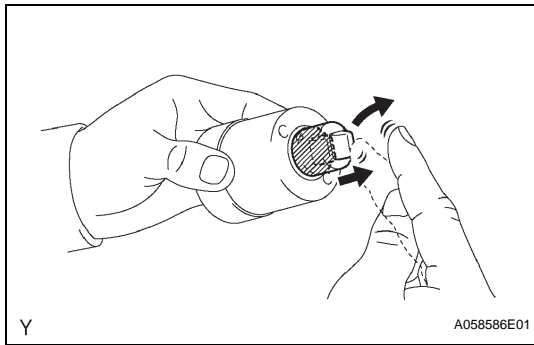
(3) Connect the battery and an ammeter to the starter as shown in the illustration.

(4) Check that the starter rotates smoothly and steadily while the pinion gear is moving out. Then measure the current.

Standard current:

90 A or less at 11.5 V

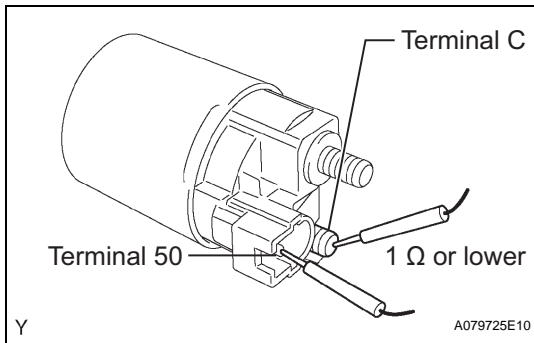
If the test result is not as specified, overhaul the starter assembly.



2. INSPECT MAGNETIC SWITCH ASSEMBLY

(a) Check the plunger.

- (1) Push in the plunger and check that it returns quickly to its original position.
If necessary, replace the magnetic switch assembly.



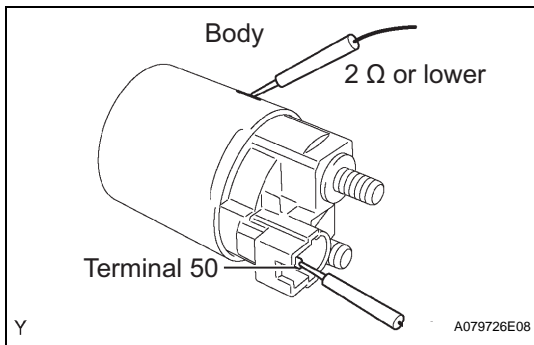
(b) Check if the pull-in coil has an open circuit.

- (1) Measure the resistance between terminals 50 and C.

Standard resistance:

1 Ω or lower

If the result is not as specified, replace the magnetic switch assembly.



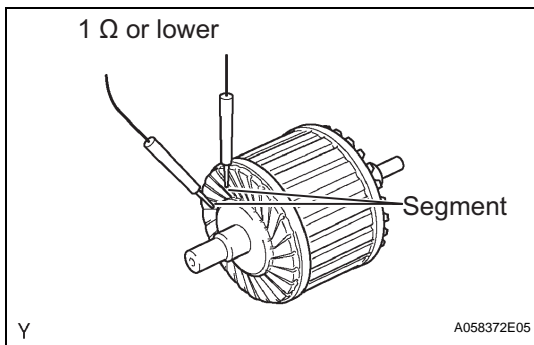
(c) Check if the hold-in coil has an open circuit.

- (1) Measure the resistance between terminal 50 and the switch body.

Standard resistance:

2 Ω or lower

If the result is not as specified, replace the magnetic switch assembly.



3. INSPECT STARTER ARMATURE ASSEMBLY

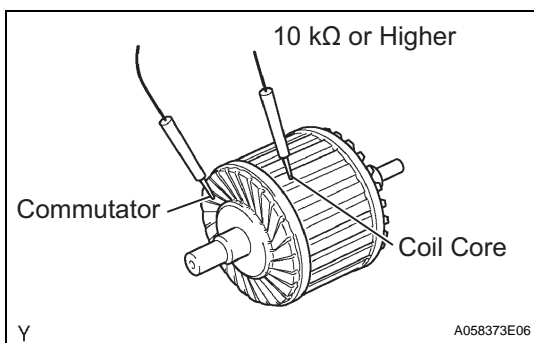
(a) Check if the commutator has an open circuit.

- (1) Measure the resistance between the segments of the commutator.

Standard resistance:

1 Ω or lower

If the result is not as specified, replace the starter armature assembly.



(b) Check if the commutator is grounded.

- (1) Measure the resistance between the commutator and armature coil core.

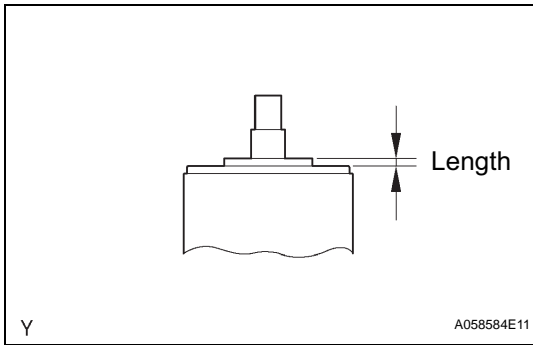
Standard resistance:

10 kΩ or higher

If the result is not as specified, replace the starter armature assembly.

(c) Check the commutator for contamination and burns on its surface.

If the surface is dirty or burnt, correct it with sandpaper (No. 400) or a lathe.



- (d) Using a vernier caliper, measure the commutator's length.

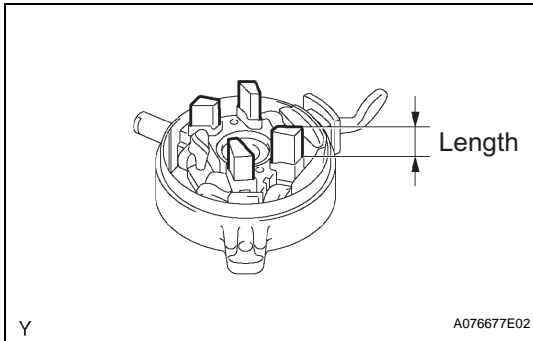
Standard length:

3.1 mm (0.122 in.)

Maximum length:

3.8 mm (0.150 in.)

If the length is greater than the maximum, replace the starter armature assembly.



4. INSPECT STARTER COMMUTATOR END FRAME ASSEMBLY

- (a) Using a vernier caliper, measure the brush length.

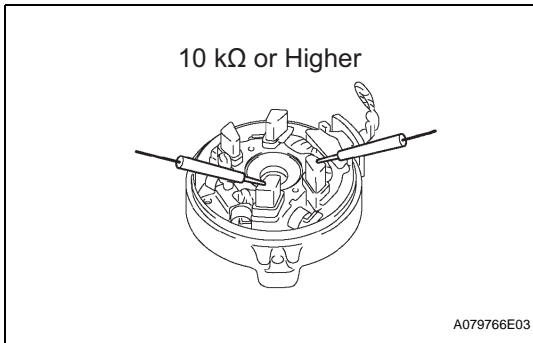
Standard length:

9.0 mm (0.354 in.)

Minimum length:

4.0 mm (0.158 in.)

If the length is less than the minimum, replace the starter commutator end frame assembly.



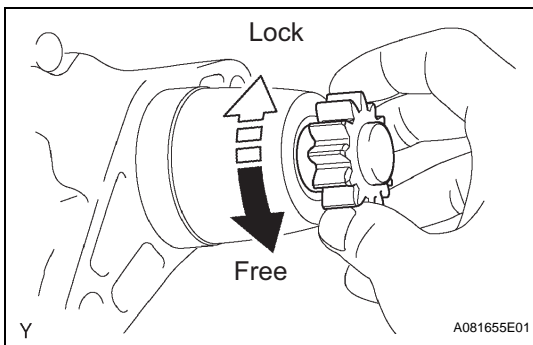
- (b) Check the brush insulation.

- (1) Measure the resistance between the positive (+) and negative (-) brush.

Standard resistance:

10 kΩ or higher

If the result is not as specified, repair or replace the starter commutator end frame assembly.



5. INSPECT STARTER CLUTCH

- (a) Check the starter clutch.

- (1) Rotate the clutch pinion gear counterclockwise and check that it turns freely. Try to rotate the clutch pinion gear clockwise and check that it locks.

If necessary, replace the starter drive housing assembly.

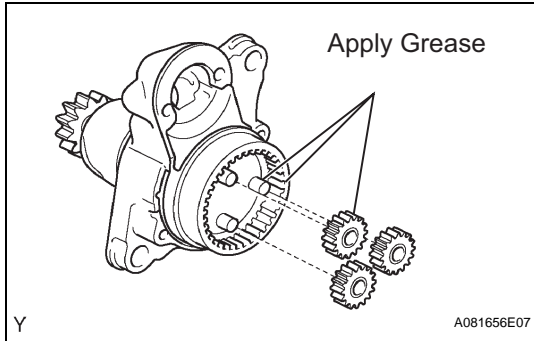
REASSEMBLY

HINT:

Use high-temperature grease to lubricate the bearings, gears, return spring and steel ball when assembling the starter.

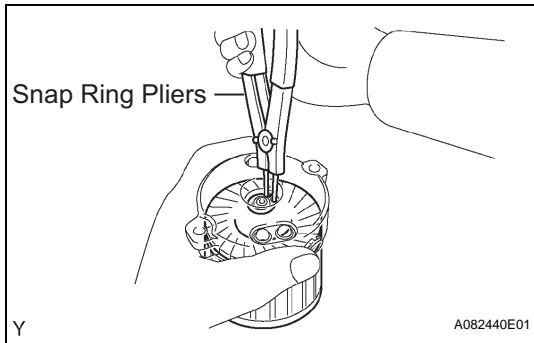
1. INSTALL PLANETARY GEAR

- (a) Apply grease to the planetary gears and pin parts of the planetary shaft.
- (b) Install the 3 planetary gears.



2. INSTALL STARTER ARMATURE ASSEMBLY

- (a) Apply grease to the plate washers and the armature shaft.
- (b) Install the starter armature assembly to the starter commutator end frame assembly.
- (c) Using snap ring pliers, install the plate washer and a new snap ring.

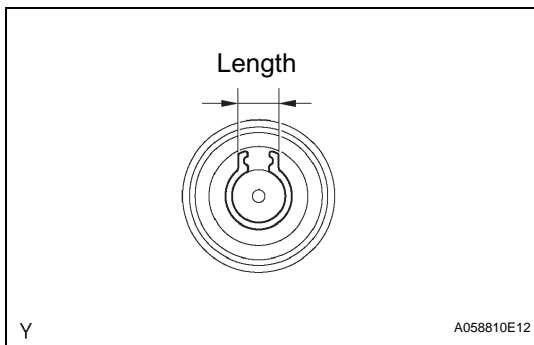


- (d) Using a vernier caliper, measure the length of the snap ring.

Maximum length:

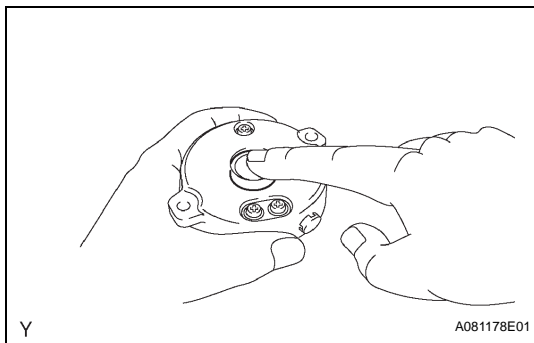
5.0 mm (0.197 in.)

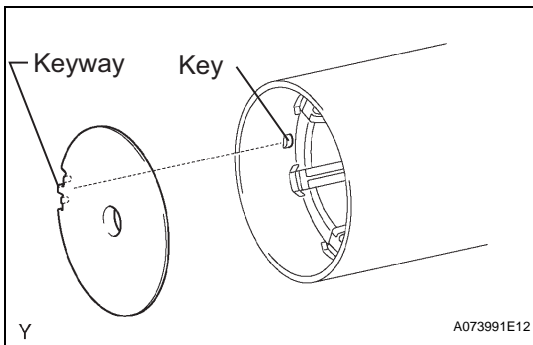
If the length is greater than the maximum, replace it with a new snap ring.



3. INSTALL STARTER COMMUTATOR END FRAME COVER

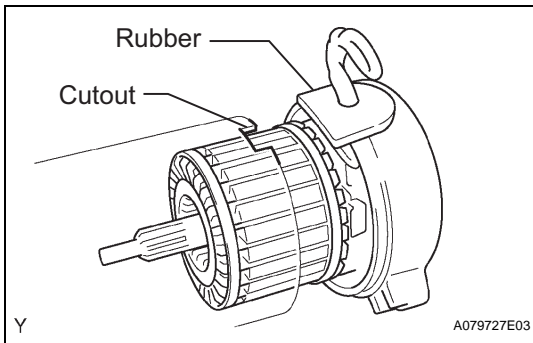
- (a) Install the starter commutator end frame cover to the starter commutator end frame assembly.





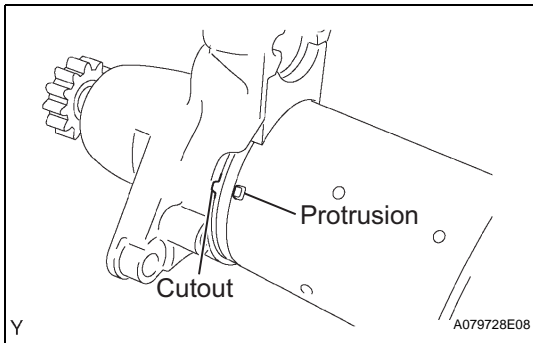
4. INSTALL STARTER ARMATURE PLATE

- (a) Insert the starter armature plate to the starter yoke assembly.
- (1) Align the keyway of the starter armature plate with the key inside the starter yoke assembly, and install the starter armature plate.



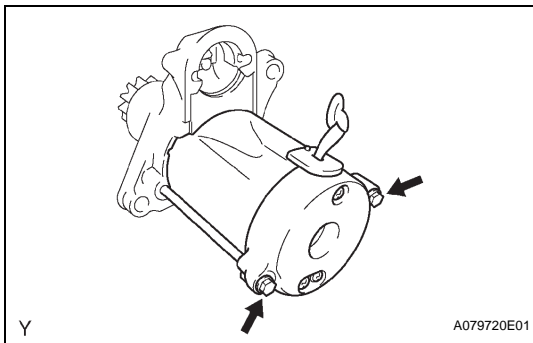
5. INSTALL STARTER COMMUTATOR END FRAME ASSEMBLY

- (a) Align the rubber of the starter end frame assembly with the cutout of the starter yoke assembly.
- (b) Install the starter commutator end frame assembly to the starter yoke assembly.

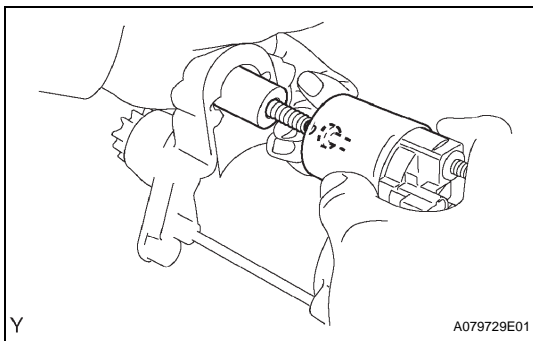


6. INSTALL STARTER YOKE ASSEMBLY

- (a) Align the protrusion of the starter yoke assembly with the cutout of the starter drive housing assembly.

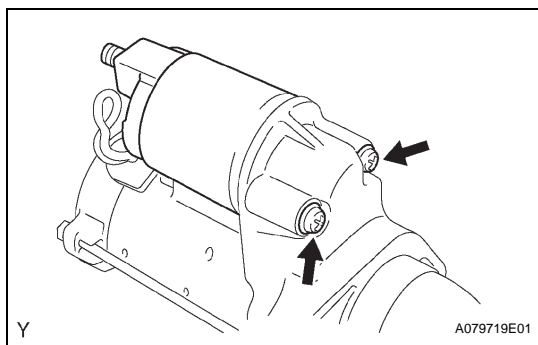


- (b) Install the starter yoke assembly with the 2 through-bolts.
Torque: 6.0 N*m (61 kgf*cm, 53 in.*lbf)

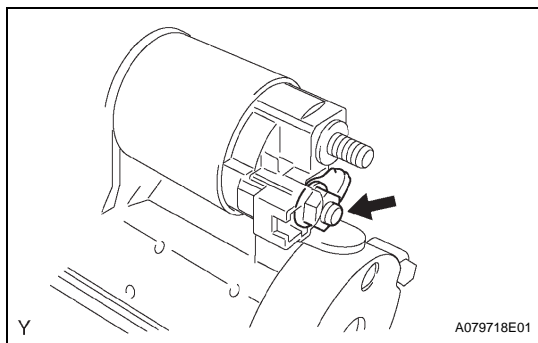


7. INSTALL MAGNETIC SWITCH ASSEMBLY

- (a) Apply grease to the plunger and the hook.
- (b) Hang the plunger hook of the magnetic switch assembly on the drive lever.
- (c) Install the plunger and return spring.



- (d) Install the magnetic switch with the 2 screws.
Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

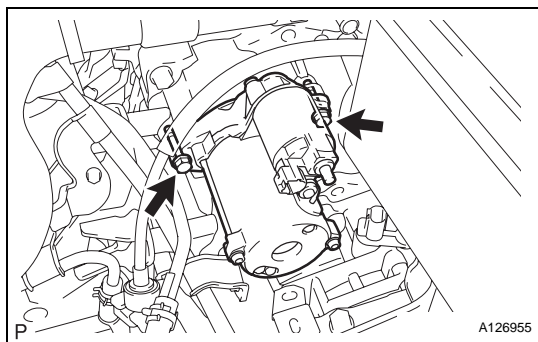


- (e) Connect the lead wire to the magnetic switch with the nut.
Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

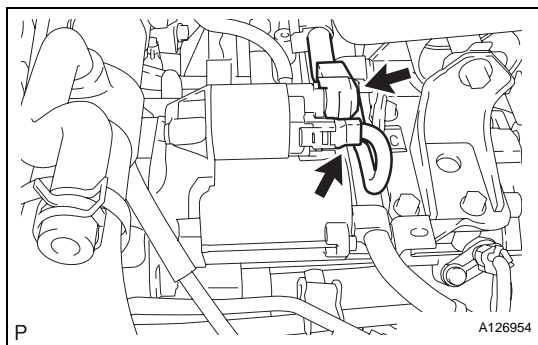
INSTALLATION

1. INSTALL STARTER ASSEMBLY

- (a) Install the starter with the 2 bolts.
Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf)

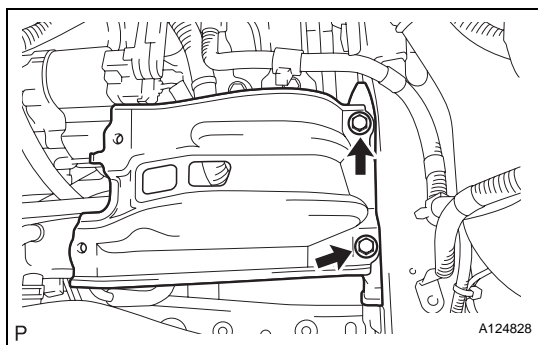


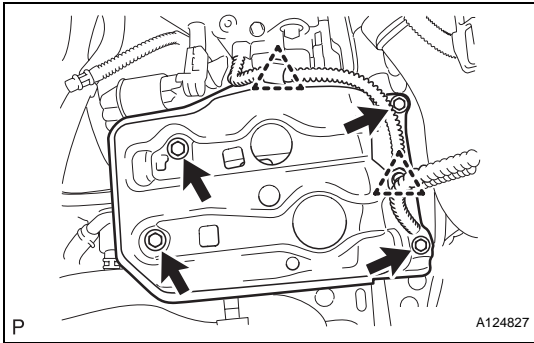
- (b) Connect the starter connector.
 (c) Install the terminal nut and cover the nut with the cap.
Torque: 9.8 N*m (100 kgf*cm, 88 in.*lbf)



2. INSTALL BATTERY BRACKET REINFORCEMENT

- (a) Install the battery bracket reinforcement with the 2 bolts.
Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)





3. **INSTALL FRONT BATTERY CARRIER**
 - (a) Install the front battery carrier with the 4 bolts.
Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)
 - (b) Connect the 2 clamps of the engine wire.
4. **INSTALL BATTERY TRAY**
5. **INSTALL BATTERY**
6. **INSTALL BATTERY INSULATOR**
7. **INSTALL BATTERY CLAMP SUB-ASSEMBLY**
 - (a) Install the battery clamp by tightening the bolt and nut.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf) for nut
8.5 N*m (87 kgf*cm, 75 in.*lbf) for bolt
8. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

STARTER RELAY

ON-VEHICLE INSPECTION

- 1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
CAUTION:
Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.
- 2. REMOVE STARTER RELAY (Marking: ST)
(a) Remove the starter relay from the No. 7 relay block.
- 3. INSPECT STARTER RELAY (Marking: ST)
(a) Measure the resistance of the relay.

Standard resistance

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (when battery voltage is applied to terminals 1 and 2)

If the resistance is not as specified, replace the relay.

- 4. INSTALL STARTER RELAY (Marking: ST)
- 5. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

